Welcome to the Virtual Machine

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Machine Magic

- Two Anecdotes
- Small revolutions in the ways we work

What is a Virtual Machine?

- A brief definition
- A brief history

Important Terminology

- “Host” and “Guest”
- “Hypervisor” (Type 1 and Type 2)
- “Paravirtualization”

Types of Virtual Machine Architecture

- Emulation in software
- Direct hardware access
- Hybrid

Hardware Access and Acceleration

- PAE/NX
- VT-x and AMD-V
- Nested paging
- 3D acceleration
- 2D acceleration in Windows guests

Virtual Machine Software

- Virtualbox
- VMware
- Xen
- KVM (Kernel-based Virtual Machine)
- Qemu
- Parallels
- Microsoft Hyper-V

Virtual Machine Configuration

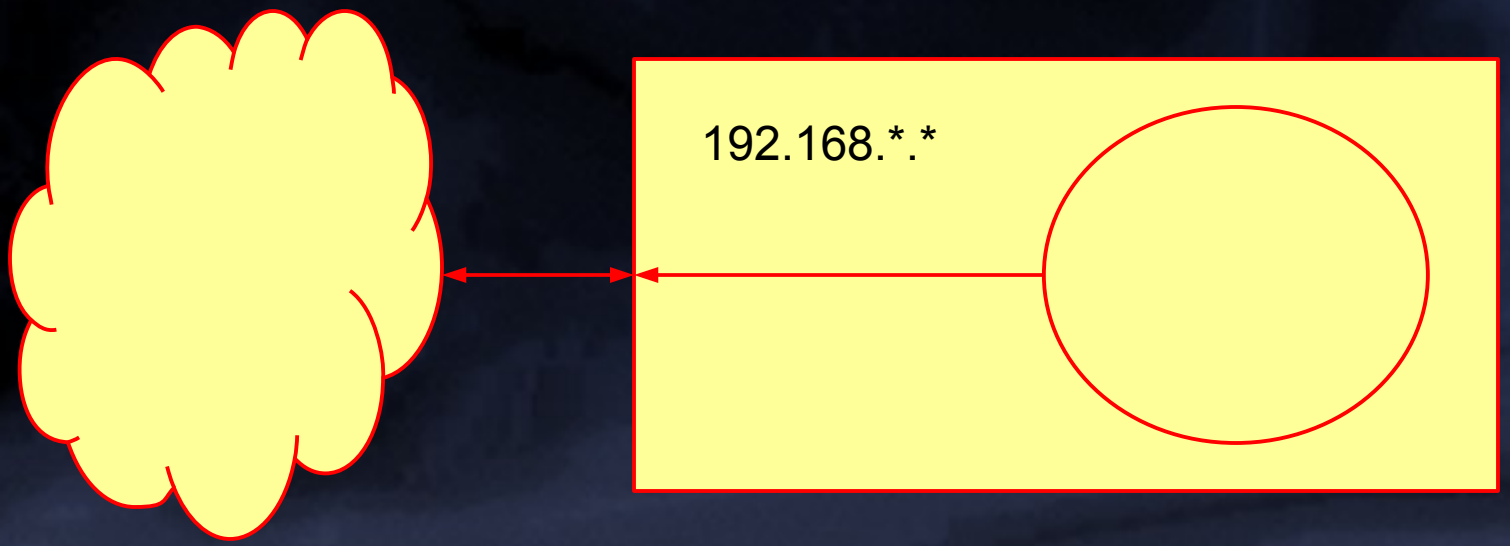
- Hard drive size
- Amount of memory
- Number of processors
- Processor acceleration
- Video acceleration
- Amount of video memory
- Peripherals

Virtual Machine Configuration

- Hard drive configuration and performance: IDE and SATA
- Linux kernel and SATA drivers
- Windows and SATA drivers
  - WinXP, must load Intel Matrix Storage Drivers in guest OS
- Host disk I/O caching

Virtual Machine Configuration

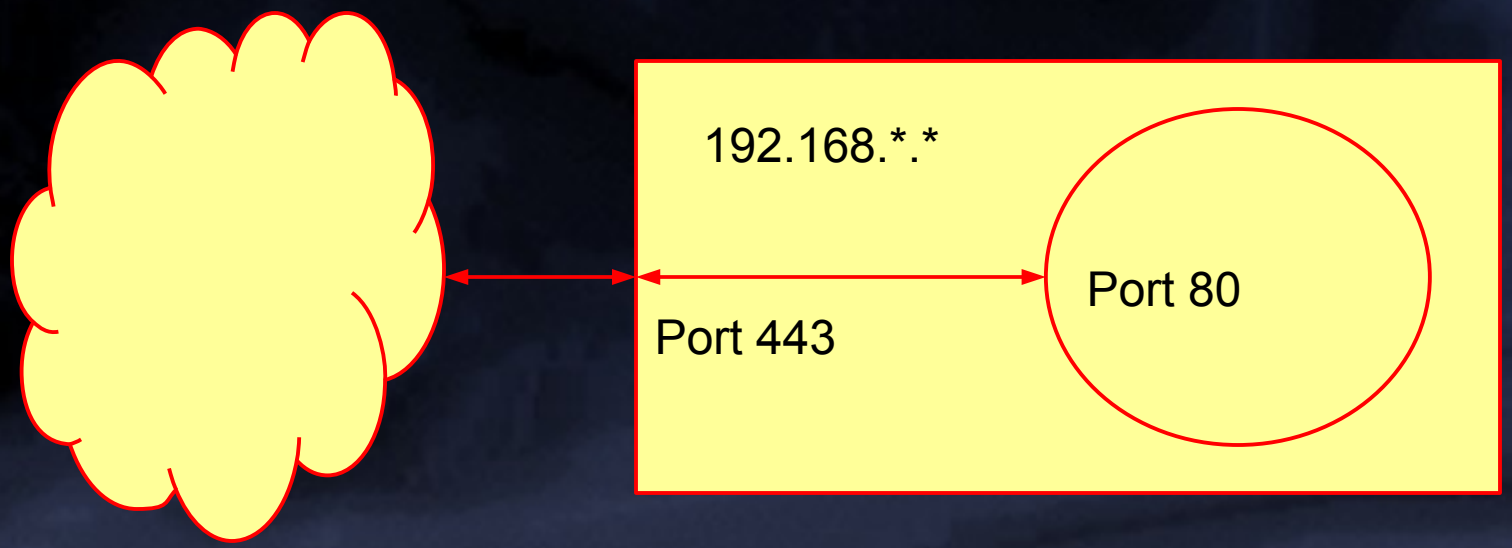
- Networking: Network Address Translation (NAT)



The guest's virtual NIC forwards traffic to the host's hardware NIC, which acts as a proxy. The guest sits in a private network space. It can communicate with the outside world, but not vice versa.

Virtual Machine Configuration

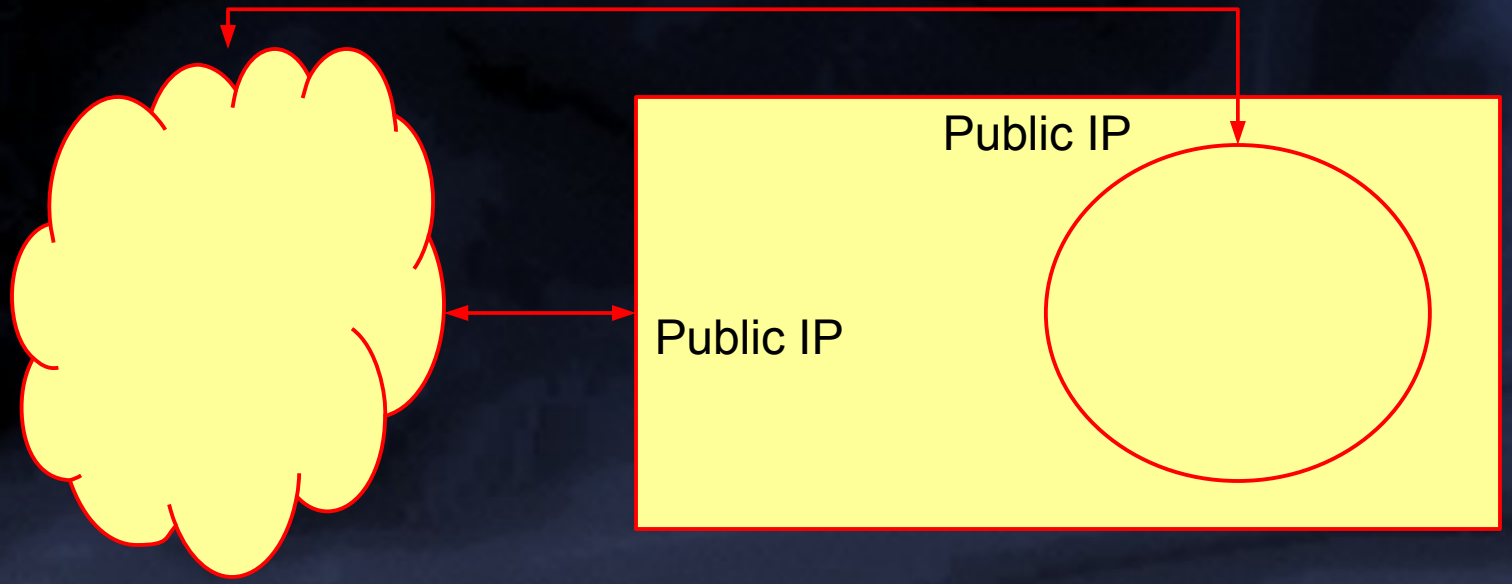
- Networking: NAT and port forwarding



A port on the guest NIC is forwarded to a port on the host NIC. Traffic on the public Internet can then communicate with the guest through the host NIC's port.

Virtual Machine Configuration

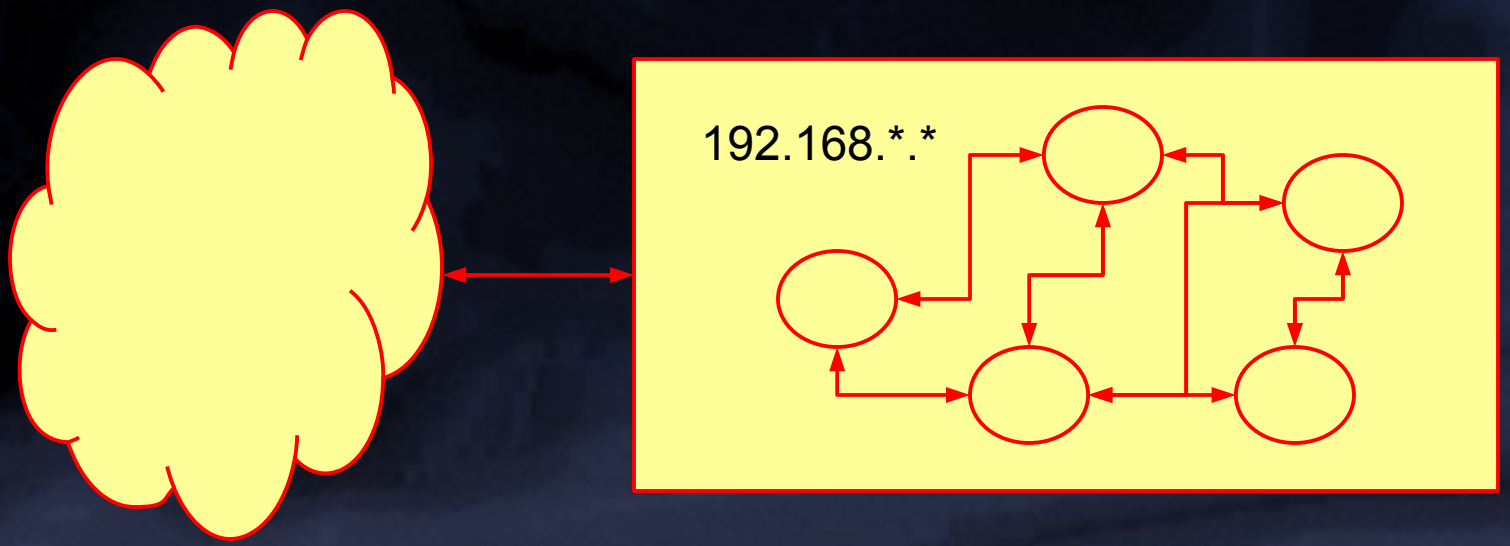
- Networking: Bridged networking



Here is some Machine Magic: Both the host and the guest have addressable (internally and externally) NICs. So multiple IP addresses are bound to a single hardware NIC. Nice!

Virtual Machine Configuration

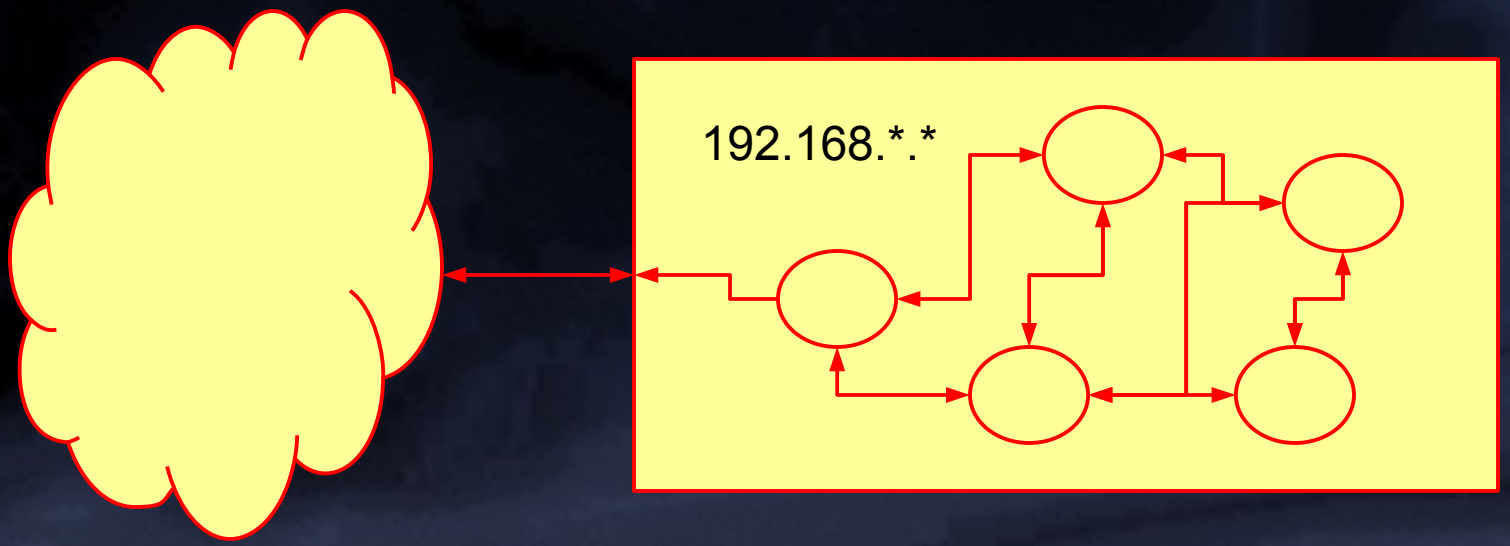
- Networking: Internal networking



A network of guests can communicate between and among themselves, but not with the outside world.

Virtual Machine Configuration

- Networking: Host-only networking



A network of guests can communicate between and among themselves and with the outside world via a software “loopback” NIC.

Virtual Machine Configuration

- Guest additions
  - Seamless mouse integration
  - Resizing of guest display
  - Shared folders

Virtual Machine Configuration

- Packaging and transfer of VMs between host machines
- The notion of a “virtual appliance”
- Open Virtualization Format (OVF)
- Related concept: “Snapshots”

Library Use Cases

- No cost learning tool
- Configuration playground
- VMs in the data center

Demonstrations

- Windows guest on Ubuntu host
- Ubuntu guest on Windows host
- Setting up a VM with Android
- Saving a VM as a “virtual appliance”
- Transferring, installing, and booting a virtual appliance

Demonstrations

- Port forwarding in action
- Remoting into a Virtual Machine
- Booting the Xen hypervisor

Watch for my upcoming editorial on VMs in *Information Technology and Libraries!*

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